

**Objective 4:**  
**Managing the Economic  
Consequences of BMSB Damage**

**Jayson K. Harper**

**Professor of Agricultural Economics**

**The Pennsylvania State University**



**PennState**

# Objectives & Expected Outcomes

- Assess the economic potential of biological control as a long-term strategy for managing BMSB populations (Objective 2)
- Develop estimates of the cost and benefits of specific management practices for BMSB (Objective 3)
- Assist with development of program evaluation tools (Objective 5)

*Economic analysis will help encourage adoption of both landscape scale management strategies and farm-level management practices for the BMSB*

## ***4.a. Assess the economic potential of biological control of BMSB on high value specialty crops***

- Past studies have shown that a complete economic evaluation of a biological control project is a complicated undertaking and is a more manageable undertaking if the pest attacks only a specific type of crop in a fairly limited geographic area
- For BMSB the scale of the problem is a major consideration because, unlike most previous biological control efforts, this insect attacks many different crops and also impacts the quality of life for affected homeowners and non-farm businesses.

# Assessing the benefits and costs of biological control will require:

- Estimation of the pre-introduction costs of research, quarantine, and implementation of the proposed biological control program
- Estimation of the cost of the rearing and assisted dispersal of imported parasitoids (for example *T. japonicus*).
- Determining the contributions of native predators, parasitoids, adventive populations, and potential entomopathogens

# Case studies in biological control?

- Because of the scale of the problem, may need to concentrate on:
  - Locations with adventive populations
  - When/where assisted dispersal is allowed
- Mechanisms for collecting survey responses
  - Surveys at extension meetings
  - StopBMSB website
  - Survey Monkey through directed e-mails or website links

# Gauging the value of biological control

**Successful biological control would lower pest management costs, increase yields, and improve quality for farmers and improve quality of life for affected homeowners.**

- Assess potential acceptance and value:
  - Contingent valuation method
    - Commonly used to value public goods (parks), externalities (pollution), and existence values (endangered species or unique landmarks)
  - For BMSB, questionnaires would be used to determine the perceived value and potential acceptance of biological control by affected farmers and property owners
  - Generate a benefit-cost ratio that expresses value of biological control to effected population stemming from public investment in biological control tactics

# Questionnaire design

- Where are you located? County and State
- What is your primary crop?
  - Agronomic crops
  - Nursery crops
  - Nuts
  - Small fruit
  - Tree fruit
  - Vegetables
- When did BMSB become a problem on your operation?
  - 2010 or before
  - 2011
  - 2012
  - 2013
  - 2014
  - 2015
  - 2016
  - Not a problem yet

# Questionnaire design

- **What management practices have you used to reduce the impact of BMSB on you profitability? (check all that apply to you)**
  - Use additional insecticide sprays
  - Spend more time monitoring populations of BMSB
  - Instruct pickers to not harvest damaged crops
  - Spend more time grading and packing
  - Use improved monitoring techniques and treatment thresholds
  - Other \_\_\_\_\_
- **Are you:**
  - More concerned about BMSB than when you first discovered them
  - Concerned about the same about BMSB as when I first discovered them
  - Less concerned about BMSB than when I first discovered them
  - unsure of impact because it is a new pest to me

# Potential questions

Some of the management practices that are being tested for BMSB include improved monitoring, attract and kill, trap crops, repellents, netting and barriers, and...

Rate each of these for their suitability on your operation:

– Improved monitoring

UNLIKELY TO USE

MIGHT USE

LIKELY TO USE

DEFINITELY WILL USE

– Attract and kill

UNLIKELY TO USE

MIGHT USE

LIKELY TO USE

DEFINITELY WILL USE

– Trap crops

UNLIKELY TO USE

MIGHT USE

LIKELY TO USE

DEFINITELY WILL USE

– Repellents

UNLIKELY TO USE

MIGHT USE

LIKELY TO USE

DEFINITELY WILL USE

– Netting/barriers

UNLIKELY TO USE

MIGHT USE

LIKELY TO USE

DEFINITELY WILL USE

# How have these factors associated with BMSB impacted the profitability of your operation?

Reduced yield

NO IMPACT    SLIGHT IMPACT    MODERATE IMPACT    SEVERE IMPACT

Reduced quality

NO IMPACT    SLIGHT IMPACT    MODERATE IMPACT    SEVERE IMPACT

Increased spray cost

NO IMPACT    SLIGHT IMPACT    MODERATE IMPACT    SEVERE IMPACT

Increased harvest and grading costs

NO IMPACT    SLIGHT IMPACT    MODERATE IMPACT    SEVERE IMPACT

Increased monitoring costs

NO IMPACT    SLIGHT IMPACT    MODERATE IMPACT    SEVERE IMPACT

# Potential questions

**Description of biological control and *T. japonicus* for the CVM questionnaire:**

*Biological control is the use of natural enemies to manage an insect population. Because BMSB originally came from Asia, naturally occurring predators of the BMSB don't currently exist in large enough numbers to effectively control them in the United States. One of the most promising natural enemies of the BMSB is a tiny parasitic wasp (also from Asia) that attacks BMSB eggs. The mass release of these wasps is a management tactic that could provide safe, environmentally-friendly, and economical control of the BMSB. Additional testing of these wasps is needed to determine how they might affect other insects and the environment before governmental approval can be granted for their release.*

# If/when a biological control for BMSB is approved for use, would you:

- Want to see them released in your area?  
Yes No
- Be willing to have them released on your operation?  
Yes No
- Still have concerns on how they may affect the environment?  
Yes No

If/when a biological control for BMSB is approved for use, who do you think should pay for the program?

- agricultural producers pay for release on their own operation
- all property owners in an affected area pay an assessment to cover program costs
- agricultural producers and government share the cost of the program
- all property owners and government share the cost of the program
- government pays the entire cost of the program
- would rather use other tactics to manage them on my property

# Willingness to pay

- CVM surveys are based on interviews where households are asked , among other things, their willingness to pay (WTP) for some public project
- CVM tries to gauge individual willingness to pay
  - If a biological control agent was available that provided  $x\%$  effectiveness for BMSB, how much would you be willing to pay for it?

# Sample of Willingness to Pay Questions

- How much has BMSB reduced your profitability (on average)? \_\_\_\_\_%
- How much has BMSB affected your profitability (on average)? \$\_\_\_\_\_/acre
- How much would the biological control be worth to you if it totally eliminated the need to control for BMSB? \$\_\_\_\_\_/acre
- How much would the biological control be worth to you if it eliminated **X%** of BMSB? \$\_\_\_\_\_/acre
- How much would the biological control be worth to you if BMSB became a problem only once in every **X** years? \$\_\_\_\_\_/acre

# Economic Impact of Biological Control

- CVM survey will be used to gauge perceived economic impact of biological control
- After introduction, surveys could be used to track actual management response and assess the benefit of biological control on specific crops/production systems

## ***4.b. Develop estimates of the cost and benefits of specific management practices for BMSB***

### **Some potential evaluations:**

- estimating the cost of lures, traps, and labor inputs associated with monitoring BMSB populations to make threshold based management decisions.
- comparing the cost of crop damage in threshold-based IPM programs versus conventionally managed systems that require multiple insecticide sprays.
- determining the cost and benefits of using sustainable management tools like trap crops, insectary strips, border sprays, and attract-and-kill strategies for various specialty crops.
- evaluating the cost of reduced risk options to replace broad spectrum pyrethroid and neonicotinoid insecticides

### ***4.c. Assist with the development of program evaluation tools including survey instruments***

- Help develop surveys to assess the needs of specific audiences for decision-making tools that assist users select effective management tactics for the BMSB.
- Also part of the BMSB SCRI Extension Committee charged with identifying educational materials, surveys, and evaluation needs of the project